REMARKS

In the Office Action, claims 1-16, 18-33, 35 and 36 were rejected. Claims 17 and 34 were objected to. Reconsideration and allowance of all pending claims are requested.

Rejections Under 35 U.S.C. § 103

Claims 1, 5, 6, 9, 10, 12-16, 20-22, 24, 25, 28-32 and 35 were rejected under 35 U.S.C. §103(a) as being unpatentable over "Robust design through the use of a hybrid genetic algorithm", Hacker et al., Proceedings of DETC'02, DETC2002/DAC-34108 or U.S. Patent 5,633,800 issued to Bankert et al. in view of U.S. Patent Application Publication 2002/0123870 issued to Chan et al. or "Improving the Aircraft Design Process Using Web-based Modeling and Simulation", Reed et al., ACM Transactions of Modeling and Computer Simulation, Vol. 10, No. 1, January 2000. Further, claims 2-4, 7, 8, 11, 18, 19, 23, 26, 27, 33 and 36 were rejected under 35 U.S.C. §103(a) as being unpatentable in further view of U.S. Patent 6,681,155 issued to Fujita et al. The Applicants respectfully traverse this rejection.

For a *prima facia* case of obviousness, the Examiner must set forth the differences in the claim over the applied reference, set forth the proposed modifications of the reference, which would be necessary to arrive at the claimed subject matter, and explain why the proposed modification would be obvious.

Rejections in view of art

Examiner's response to arguments

In the Response to Arguments section of the Office Action, the Examiner requested clarification as to how the invention "targets" integrating the design for the operations and controls as asserted by Applicants, *e.g.* specifically what parameters are targeted in the operations and control. The Applicants respectfully submit that such parameters are clearly described in paragraph 37, page 7 of the present application.

The relevant portion of paragraph 37 reads:

> The operations model or scheme 202 designed by the operation design process 102 and the constraints 206 (both *operation and control constraints*) are used to define a control transfer function (or control curve) 204 that are used by the controller 200 to provide a feed forward control of the parameters used by the operation model 202 to control the gas turbine 250. The exemplary parameters controlled according to the operation model shown in Figure 2 include the Inlet Guide Vane(IGV) angle 210, the Inlet Bleed Heat (IBH) 212, and a fuel flow related value, the Fuel Stroke Reference (FSR) 214. Each of these parameters are limited to bounds (both at steady state and during a transient state) that depend on one or more of the control and operation constraints 206. (Emphasis added.)

Further, on page 3 of the present Office Action, while responding to the Applicants' 103 arguments in the previous Office Action Response, the Examiner did not address the main thrust of the Applicants' arguments put forward in the previous response, *viz.* that the prior art does not teach an optimizer/controller capable of co-ordinating the functions of optimization and control in a gas engine, or a dynamic optimizer/controller that dynamically optimizes and controls operation of the gas turbine using model based control. The Examiner, on the contrary, focused on the use of model based control and stated that a key feature of model predictive control is that the future process behavior is predicted using a model and available measurements of controlled variables. The Applicants respectfully observe they fail to teach model based control. Applicants, on the other hand, teach and claim providing an *online dynamic optimizer/controller* that *dynamically optimizes and controls* operation of the gas turbine using model based control based on the operations model and the operations and control constraints.

Further, the Examiner stated that Applicants' arguments filed on July 24, 2006 relating to the assertion that the claimed invention was novel over the prior art because it "targets integrating the design for the operations and the controls for a gas turbine", was

not persuasive, since there did not appear to be any claim limitations that specifically required the invention to "target" the operation and controls while "integrating the design".

This statement addresses a discussion included in the previous Office Action Response. There, Applicants merely offered to provide some explanatory background information related to the utility of the present invention. However, the Examiner specifically focused on the use of the word "target" as if it related to a verbatim claim recitation. It did not. Applicants assert that the claims stand on their own as originally filed and are patentable with their current wording. Applicants request that the Examiner kindly simply review the earlier discussion for the purpose it was intended, that is, to clarify certain distinctions made in the claims by placing them into context.

The substantive rejections do not establish *prima facie* obviousness.

Claims 1, 5, 6, 9, 10, 12-16, 20-22, 24, 25, 28-32 and 35 were rejected under 35 U.S.C. 103(a) as being unpatentable over "Robust design through the use of a hybrid genetic algorithm", Hacker et al., Proceedings of DETC'02, DETC2002/DAC-34108 or US Patent 5, 633, 800 issued to Bankert et al. in view of U.S. Patent Application Publication 2002/0123870 issued to Chan et al. or "Improving the Aircraft Design Process Using Web-based Modeling and Simulation", Reed et al., ACM Transactions of Modeling and Computer Simulation, Vol. 10, No. 1 January 2000.

Chan and Reed fail to disclose the optimizer/controller required for a *prima facie* case.

Applicants respectfully submit that Hacker or Bankert and Chan or Reed, alone or in combination, do not teach, disclose or suggest all the features recited in independent claims 1, 22 and 35. Specifically, none of these references teach, disclose or suggest an online *dynamic optimizer/controller* that dynamically optimizes and controls operation of

a gas turbine. Accordingly, the combination of these references cannot possibly include these features of the claims, and thus cannot render the claims obvious.

The Examiner stated on that Hacker and Bankert do not explicitly teach dynamically optimizing the gas turbine model online (*i.e.* over the Internet). The Examiner relied on Chan and Reed for teaching optimization in an online environment. However, both Chan and Reed fail to disclose an online dynamic optimizer/controller that dynamically optimizes and controls operation of a gas turbine. In formulating the rejection of this feature, the Examiner referred to paragraph 30, Fig. 5 of Chan and section 3, Figs. 3, 4 of Reed. Applicants have carefully reviewed these sections and submit that these sections, and indeed the references as a whole fail to disclose an online dynamic optimizer/controller that dynamically optimizes and controls the operation of a gas turbine. Specifically, the sections (paragraph 30, Fig. 5) in Chan relate to an *architecture* used to implement a turbine optimizer, using one or more client computers and a turbine optimizer computer, and the sections (section 3, Figs. 3, 4) in Reed relate to principles of web-based simulation.

Paragraph 30, relating to Fig. 5 in Chan reads:

> FIG. 5 is a block diagram illustrating an architecture used to implement the turbine optimizer in one embodiment. The client computers 501 and the turbine optimizer computer 503 are interconnected via the Internet 502. The computers may include a central processing unit, memory, input devices (e.g., keyboard and pointing device), output devices (e.g., display devices), and storage devices (e.g., disk drives). The memory and storage devices are computer-readable media that may contain computer instructions that implement the turbine optimizer. In addition, the data structures (e.g., databases) and message structures (e. g., http-request messages) may be stored or transmitted via computer-readable media such as a signal via a communications link. The client computers may use browsers to access web pages of the server via the Internet. One skilled in the art will appreciate that the concept of the turbine optimizer can be used in many different environments. For example, various communication channels other than the Internet may be used, such as a local area network,

a wide area network, or a point-to-point dial-up connection. The computer systems may comprise any combination of hardware and software that can support web servers and browsers. In particular, a web server may actually include multiple computers. The client computers may comprise any combination of hardware or software that interacts with server systems.

Section 30, relating to Figs. 3, 4 in Reed reads:

Since its inception in 1990, the World Wide Web (WWW or Web) has quickly emerged as a powerful tool for connecting people and information on a global scale. Built on broadly accepted protocols, the WWW removes incompatibilities between computer systems, resulting in an "explosion of accessibility" [2, 30]. Within the simulation community, this proliferation has led to a new area of research – *Web-based Simulation*, involving the exploration of the connections between the WWW and the field of simulation. Although the majority of work in Web-based Simulation to date has centered on re-implementation of existing distributed and simulation software using Web-related technologies, there is growing acknowledgement that web-based simulation has the potential to fundamentally alter the practice of simulation [11].

In one of the first papers to explore the topic of web-based simulation, Fishwick [8] identifies many potential effects of web-based simulation, with attention given to three key areas: (1) education and training, (2) publications, and (3) simulation programs. He concludes that there is a great uncertainty in the area of Web-based simulation but advises simulation researchers and practitioners to incorporate Web-based technologies. Building on Fishwick's observations Page and Opper [25] present six principles of web-based simulation which capture the vision of future simulation practice: (1) digital objects proliferation, (2) software standards proliferation, (3) model construction by composition, (4) increased use of "trial and error" approaches, (5) proliferation of simulation use by non-experts, and (6) multi-tier architectures and multi-language systems.

In the remainder of this section, we briefly review several of these principles. In the following sections, we will examine in more detail how each apply to both the development of a simulation environment, and to the improvement of the aircraft design process.

Clearly, the above sections *in no way* relate to an online dynamic optimizer/controller that dynamically optimizes and controls operation of a gas turbine. Indeed, these references wholly fail to provide for control at all. The dynamic optimizer/controller disclosed in the present patent application provides a model-based control of a gas turbine that integrates the design of the operations scheme with the design of the controls. *See, e.g.*, Application, page 8, paragraph 41.

In short, none of Hacker, Bankert, Chan or Reed teach or suggest a dynamic optimizer/controller that dynamically optimizes and controls operation of a gas turbine. Therefore, the combination of Hacker or Bankert with Chan or Reed could not include this component or functionality.

Improper Combination - Lack of Objective Evidence of Reasons to Combine

Further, in order to establish a *prima facie* case of obviousness, the Examiner must not only show that the combination includes *all* of the claimed elements, but also a convincing line of reason as to why one of ordinary skill in the art would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227 U.S.P.Q. 972 (B.P.A.I. 1985). The Examiner must provide objective evidence, rather than subjective belief and unknown authority, of the requisite motivation or suggestion to combine or modify the cited references. *In re Lee*, 61 U.S.P.Q.2d. 1430 (Fed. Cir. 2002). Moreover, a statement that the proposed modification would have been "'obvious to one having ordinary skill in the art'" based on individual knowledge of the claimed elements cannot be relied upon to establish a *prima facie* case of obviousness without some *objective reason to combine* the teachings of the references. *Ex parte Levengood*, 28 U.S.P.Q.2d 1300 (Bd. Pat. App. & Inter. 1993); *In re Kotzab*, 217 F.3d 1365, 1371, 55 U.S.P.Q.2d. 1313, 1318 (Fed. Cir. 2000); *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 50 U.S.P.Q.2d. 1161 (Fed. Cir. 1999).

In pages 6 and 7 of the present rejection, the Examiner combined the cited references based on the statement that:

> It would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to modify the teachings of Hacker and/or Bankert relating to gas turbine modeling by objective functions and control constraints, with the teachings of Chan and/or Reed relating to online dynamic optimization, to realize the elements of the claimed invention. An obvious motivation exists, since in this case, the Hacker and/or Bankert reference teaches to the Chan and/or Reed reference, and the Chan and/or Reed reference teaches to the Hacker and/or Bankert reference. Specifically, both Hacker and/or Bankert and Chan and/or Reed teach optimization of gas turbine design and both are used in the same technological arena as noted above. Hacker and/or Bankert teaches to Chan and/or Reed because Hacker and/or Bankert teaches optimizing a gas turbine design model by objective functions and control constraints. (See: hacker and/or Bankert, Abstracts). Chan and/or Reed teaches to Hacker and/or Bankert because Chan and/or Reed specifically teaches optimizing the gas turbine design in an online environment. (See: Chan and/or Reed: Para: 0030/Abstract) Further, the level of skill required by an artisan to realize the claimed limitations of the present invention is clearly established by both references. (See: Hacker and/or Bankert/Chan and/or Reed, Abstract) Accordingly, a skilled artisan tasked with realizing *a method for designing the operations and control of a gas turbine, (Emphasis Added)*, and having access to the teachings of Hacker and/or Bankert and Chan and/or Reed, would have knowingly modified the teachings of Hacker and/or Bankert with the teachings of Chan and/or Reed (or vice versa) to realize the elements of the present invention. (Emphasis added.)

The above paragraph very clearly fails to provide the requisite motivation or suggestion to combine the cited references. In particular, Applicants are uncertain as to what the Examiner means by "teaches to each other" as set forth in the above paragraph. Further, the only statement seeming to point to a motivation or suggestion to combine the cited references refers to "*designing the operations and control of a gas turbine*" which is inadequate to arrive at the claimed element of providing an *online dynamic optimizer/controller* that *dynamically optimizes and controls* operation of the gas turbine

using model based control based on the operations model and the operations and control constraints.

For the above reasons, the Applicants respectfully request withdrawal of the rejections under 35 U.S.C. § 103.

Allowability of dependent claims

Claims 2-4, 7, 8, 11, 18, 19, 23, 26, 27, 33 and 36 were rejected under 35 U.S.C. 103(a) as being unpatentable in further view of U.S. Patent 6,681,155 issued to Fujita et al. As summarized above, all of the independent claims are patentable over the combination of Hacker or Bankert in view of Chan or Reed. The Fujita reference has been reviewed with respect to the 35 U.S.C. § 103(a) rejection and fails to obviate the deficiencies of Hacker or Bankert in view of Chan or Reed in regards to a dynamic optimizer/controller that dynamically optimizes and controls operation of a gas turbine. Accordingly claims 2-4, 7, 8, 11, 18, 19, 23, 26, 27, 33 and 36 are allowable by virtue of their dependency from allowable base claims 1, 22 and 35. These claims are believed to be clearly patentable over the cited combination. Their reconsideration and allowance are requested.

In view of the foregoing deficiencies in the teachings of the prior art, the references cannot establish a *prima facie* case of obviousness of claims 1, 22 and 35. Accordingly, these claims, and the claims depending therefrom are believed to be clearly patentable over the cited combination. Their reconsideration and allowance is respectfully requested.

Conclusion

In view of the remarks and amendments set forth above, Applicants respectfully request allowance of the pending claims. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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